

### REMARKS

Claims 1-30 remain pending in this application. Claims 19-30 are allowed. Claims 1-5 are rejected. Claims 6-18 are objected to. Applicants have amended Claim 6 herein.

#### Rejection under 35 U.S.C. 102

The Examiner rejected claims 1-5 under 35 U.S.C. 102 as being clearly anticipated by Applicant's own admission in the second paragraph of page 4.

In accordance with the Examiner's guidance (see Response to Arguments below), AFFIDAVITS of the inventors, Ji Su and Joycelyn S. Harrison, as well as the attorney of record, are provided herewith.

#### Rejection under 35 U.S.C. 103

The Examiner rejected claims 1-5 under 35 U.S.C. 103(a) as being unpatentable over *Lach et al* in view of *Pelrine et al* ("Electrostriction of Polymer Films for Microactuator"). The Examiner stated that:

- (1) With respect to claims 1 and 4-5: *Lach* disclose in fig. 5 a membrane structure comprising a membrane, a frame 10, a plurality of threads 11, and actuators 3; the reference does not disclose a polymer actuator; *Lach* disclose in the last paragraph of column 5 that the actuator is preferably linear; *Pelrine* disclose in Fig. IV an electrostrictive polymer actuator with high strains and good actuation pressures; it would have been obvious to one of ordinary skill in the art to use the actuator of *Pelrine* in the structure of *Lach* for the purpose of providing an actuator with high strains and good actuation pressures.
- (2) With respect to claims 2 and 3: *Pelrine* disclose in Fig. VI that the actuator expands and contracts.

Applicants respectfully assert that claims 1-5 are not obvious in view of the cited art combination of *Lach* and *Pelrine*. *Lach* teaches actuators that are positioned perpendicular to the membrane to be deformed (see e.g., Fig. 4; Fig. 5; column 5, lines 67-68). As *Lach* states in the abstract, "The reflective surface is elastically deformable with stiffness in bending and the actuators operate at control points of the deformable reflective surface, transversely thereto." The present invention claims an electrostrictive actuator "integrated into at least one thread" and "having a longitudinal axis that is substantially aligned with the axis of the thread" (claim 1), illustrated in FIG. 2. Neither *Lach* nor *Pelrine* teach or suggest such "substantial alignment with the axis of the thread." Although *Lach* teaches that the actuators are preferably linear, *Lach* does not teach an actuator substantially aligned with the axis of the thread.

#### Response to Arguments

The Examiner stated that Applicant's arguments filed September 4, 2002 were fully considered but were not persuasive. The Examiner stated that the Applicant is not permitted to remove Fig. 2 from the prior art without a 132 affidavit and that the rejection will be withdrawn after the affidavit has been filed. Applicants are filing 1.132 AFFIDAVITS herewith, and thus assert that that the 102 rejection should be withdrawn, and claims 1-5 allowed.

#### Allowable Subject Matter

The Examiner stated that claims 6-18 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this office action and to include all of the limitations of the base claim and any intervening claims. Further, the Examiner stated that claims 19-30 are allowed. Applicants have amended claim 6 to include all of the limitations of the base claim, and thus assert that such claims are now in condition for allowance, as are claims 7-18 which depend therefrom. Further, Applicants noted no 35 U.S.C. 112 rejections set forth by the Examiner in the office action, and assume that such language was inadvertently included.

Attached hereto is a marked-up version of the changes made to the specification.  
The attached page is captured "Version with Markings to Show Changes Made."

**CONCLUSION**

Applicants respectfully assert that, as a result of the remarks made herein, the amendment to claim 6, and the AFFIDAVITS of the inventors and attorney of record, claims 1-30 are in condition for allowance. Reconsideration and withdrawal of the objections and rejections is requested and allowance of the claims at an early date is solicited.

Respectfully submitted,

*Robin W. Edwards*

ROBIN W. EDWARDS  
Attorney of Record  
Reg. No. 39,179

April 4, 2002

757-864-9260

or

757-864-3230

NASA Langley Research Center  
Mail Stop 212  
Hampton, VA 23681-2199

FAX RECEIVED

APR 04 2003

TECHNOLOGY CENTER 2800

{00008591:2}

Received from <7578649190> at 4/4/03 3:24:11 PM [Eastern Standard Time]

Version with Markings to Show Changes Made

In the claims:

Claim 6 has been amended as follows:

6. (Amended) ~~The structure of claim 1;~~ A membrane structure, comprising:  
a membrane whose position is to be controlled;  
a supporting frame;  
a plurality of threads connecting the membrane to the supporting frame; and  
an electrostrictive polymer actuator integrated into at least one thread, the  
electrostrictive polymer actuator having a longitudinal axis that is substantially aligned  
with the axis of the thread;  
wherein the electrostrictive polymer actuator displaces along its longitudinal axis,  
thereby affecting movement of the membrane structure; and  
wherein the electrostrictive polymer actuator comprises:  
an electrostrictive polymer having a tailorable Poisson's ratio, wherein the  
electrostrictive polymer is electroded on its upper and lower surfaces;  
an upper material layer bonded to the upper electroded surface of the  
electrostrictive polymer, wherein the electroded electrostrictive polymer and upper  
material layer form a bonded assembly, wherein the bonded assembly is rolled into a roll  
having two ends, and further wherein entire adjacent surfaces within the roll contact one  
another; and  
a cap affixed to each end of the roll.